

# Science Standard Articulated by Grade Level

## Strand 1: Inquiry Process

*“Science as inquiry is basic to science education and a controlling principle in the continuing organization and selection of students’ activities. Students at all grade levels and in every domain of science should have the opportunity to use scientific inquiry and develop the ability to think and act in ways associated with inquiry...”* (National Science Education Standards, 1995).

Inquiry Process establishes the basis for students’ learning in science. Students use scientific processes: questioning, planning and conducting investigations, using appropriate tools and techniques to gather data, thinking critically and logically about relationships between evidence and explanations, and communicating results.

<b>Concept 1:</b>	<b>K-4</b>	<b>Observations, Questions, and Hypotheses</b>	Observe, ask questions, and make predictions.
	<b>5-8</b>	<b>Observations, Questions, and Hypotheses</b>	Formulate predictions, questions, or hypotheses based on observations. Locate appropriate resources.
	<b>HS</b>	<b>Observations, Questions, and Hypotheses</b>	Formulate predictions, questions, or hypotheses based on observations. Evaluate appropriate resources.
<b>Concept 2:</b>	<b>K-4</b>	<b>Scientific Testing (Investigating and Modeling)</b>	Participate in planning and conducting investigations, and recording data.
	<b>5-8</b>	<b>Scientific Testing (Investigating and Modeling)</b>	Design and conduct controlled investigations.
	<b>HS</b>	<b>Scientific Testing (Investigating and Modeling)</b>	Design and conduct controlled investigations.
<b>Concept 3:</b>	<b>K-4</b>	<b>Analysis and Conclusions</b>	Organize and analyze data; compare to predictions.
	<b>5-8</b>	<b>Analysis and Conclusions</b>	Analyze and interpret data to explain correlations and results; formulate new questions.
	<b>HS</b>	<b>Analysis, Conclusions, and Refinements</b>	Evaluate experimental design, analyze data to explain results and to propose further investigations. Design models.

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<b>Concept 4:</b>	<b>K-4</b>	<b>Communication</b>	Communicate results of investigations.
	<b>5-8</b>	<b>Communication</b>	Communicate results of investigations.
	<b>HS</b>	<b>Communication</b>	Communicate results of investigations.

## Strand 2: History and Nature of Science

*“Knowledge of the nature of science is central to the understanding of the scientific enterprise.”* (National Assessment of Educational Progress, 2000)

Scientific investigation grows from the contributions of many people. History and Nature of Science emphasizes the importance of the inclusion of historical perspectives and the advances that each new development brings to technology and human knowledge. This strand focuses on the human aspects of science and the role that scientists play in the development of various cultures.

<b>Concept 1:</b>	<b>K-4</b>	<b>History of Science as a Human Endeavor</b>	Identify individual and cultural contributions to scientific knowledge.
	<b>5-8</b>	<b>History of Science as a Human Endeavor</b>	Identify individual, cultural, and technological contributions to scientific knowledge.
	<b>HS</b>	<b>History of Science as a Human Endeavor</b>	Identify individual, cultural, and technological contributions to scientific knowledge.
<b>Concept 2:</b>	<b>K-4</b>	<b>Nature of Scientific Knowledge</b>	Understand how science is a process for generating knowledge.
	<b>5-8</b>	<b>Nature of Scientific Knowledge</b>	Understand how science is a process for generating knowledge.
	<b>HS</b>	<b>Nature of Scientific Knowledge</b>	Understand how scientists evaluate and extend scientific knowledge.

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### Strand 3: Science in Personal and Social Perspectives

Science in Personal and Social Perspectives emphasizes developing the ability to design a solution to a problem, to understand the relationship between science and technology, and the ways people are involved in both. Students understand the impact of science and technology on human activity and the environment. This strand affords students the opportunity to understand their place in the world – as living creatures, consumers, decision makers, problem solvers, managers, and planners.

<b>Concept 1:</b>	<b>K-4</b>	<b>Changes in Environments</b>	Describe the interactions between human populations, natural hazards, and the environment.
	<b>5-8</b>	<b>Changes in Environments</b>	Describe the interactions between human populations, natural hazards, and the environment.
	<b>HS</b>	<b>Changes in Environments</b>	Describe the interactions between human populations, natural hazards, and the environment.
<b>Concept 2:</b>	<b>K-4</b>	<b>Science and Technology in Society</b>	Understand the impact of technology.
	<b>5-8</b>	<b>Science and Technology in Society</b>	Develop viable solutions to a need or problem.
	<b>HS</b>	<b>Science and Technology in Society</b>	Develop viable solutions to a need or problem.
<b>Concept 3:</b>	<b>HS</b>	<b>Human Population Characteristics</b>	Analyze factors that affect human populations.

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## Strand 4: Life Science

*"The fundamental goal of life sciences is to attempt to understand and explain the nature of life." (NAEP 2000)*

Life Science expands students' biological understanding of life by focusing on the characteristics of living things, the diversity of life, and how organisms and populations change over time in terms of biological adaptation and genetics. This understanding includes the relationship of structures to their functions and life cycles, interrelationships of matter and energy in living organisms, and the interactions of living organisms with their environment.

<b>Concept 1:</b>	<b>K-4</b>	<b>Characteristics of Organisms</b>	Understand that basic structures in plants and animals serve a function.
	<b>5-8</b>	<b>Structure and Function in Living Systems</b>	Understand the relationships between structures and functions of organisms.
	<b>HS</b>	<b>The Cell</b>	Understand the role of the cell and cellular processes.
<b>Concept 2:</b>	<b>K-4</b>	<b>Life Cycles</b>	Understand the life cycles of plants and animals.
	<b>5-8</b>	<b>Reproduction and Heredity</b>	Understand the basic principles of heredity.
	<b>HS</b>	<b>Molecular Basis of Heredity</b>	Understand the molecular basis of heredity and resulting genetic diversity.
<b>Concept 3:</b>	<b>K-4</b>	<b>Organisms and Environments</b>	Understand the relationships among various organisms and their environment.
	<b>5-8</b>	<b>Populations of Organisms in an Ecosystem</b>	Analyze the relationships among various organisms and their environment.
	<b>HS</b>	<b>Interdependence of Organisms</b>	Analyze the relationships among various organisms and their environment.
<b>Concept 4:</b>	<b>K-4</b>	<b>Diversity, Adaptation, and Behavior</b>	Identify plant and animal adaptations.
	<b>5-8</b>	<b>Diversity, Adaptation, and Behavior</b>	Identify structural and behavioral adaptations.
	<b>HS</b>	<b>Biological Evolution</b>	Understand the scientific principles and processes involved in biological evolution.
<b>Concept 5:</b>	<b>HS</b>	<b>Matter, Energy, and Organization in Living Systems (Including Human Systems)</b>	Understand the organization of living systems, and the role of energy within those systems.

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### Strand 5: Physical Science

*"The physical science component ... should probe the following major topics: matter and its transformations, energy and its transformations, and the motion of things." (NAEP 2000)*

Physical Science affords students the opportunity to increase their understanding of the characteristics of objects and materials they encounter daily. Students gain an understanding of the nature of matter and energy including their forms, the changes they undergo, and their interactions. By studying objects and the forces that act upon them, students develop an understanding of the fundamental laws of motion, knowledge of the various ways energy is stored in a system, and the processes by which energy is transferred between systems and surroundings.

<b>Concept 1:</b>	<b>K-4</b>	<b>Properties of Objects and Materials</b>	Classify objects and materials by their observable properties.
	<b>5-8</b>	<b>Properties and Changes of Properties in Matter</b>	Understand physical and chemical properties of matter.
	<b>HS</b>	<b>Structure and Properties of Matter</b>	Understand physical, chemical, and atomic properties of matter.
<b>Concept 2:</b>	<b>K-4</b>	<b>Position and Motion of Objects</b>	Understand spatial relationships and the way objects move.
	<b>5-8</b>	<b>Motion and Forces</b>	Understand the relationship between force and motion.
	<b>HS</b>	<b>Motions and Forces</b>	Analyze relationships between forces and motion.
<b>Concept 3:</b>	<b>K-4</b>	<b>Energy and Magnetism</b>	Investigate different forms of energy.
	<b>5-8</b>	<b>Transfer of Energy</b>	Understand that energy can be stored and transferred.
	<b>HS</b>	<b>Conservation of Energy and Increase in Disorder</b>	Understand ways that energy is conserved, stored, and transferred.
<b>Concept 4:</b>	<b>HS</b>	<b>Chemical Reactions</b>	Investigate relationships between reactants and products in chemical reactions.
<b>Concept 5:</b>	<b>HS</b>	<b>Interactions of Energy and Matter</b>	Understand the interactions of energy and matter.

# Science Standard

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### Strand 6: Earth and Space Science

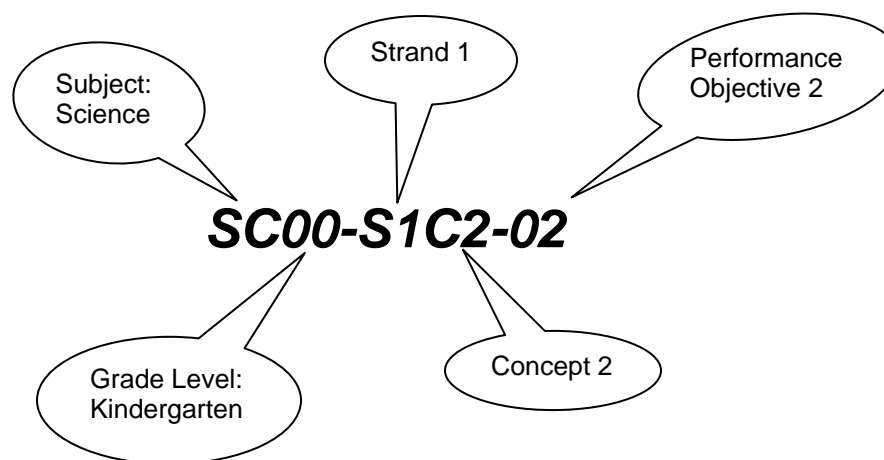
*"Earth science is the study of the planets, Earth's composition, processes, environments and history, focusing on the solid Earth, and its interaction with air and water." (NAEP 2000)*

Earth and Space Science provides the foundation for students to develop an understanding of the Earth, its history, composition, and formative processes, and an understanding of the solar system and the universe. Students study the regularities of the interrelated systems of the natural world. In doing so, they develop understandings of the basic laws, theories, and models that explain the world (NSES, 1995). By studying the Earth from both a historical and current time frame, students can make informed decisions about issues affecting the planet on which they live.

<b>Concept 1:</b>	<b>K-4</b>	<b>Properties of Earth Materials</b>	Identify the basic properties of Earth materials.
	<b>5-8</b>	<b>Structure of the Earth</b>	Describe the composition and interactions between the structure of the Earth and its atmosphere.
	<b>HS</b>	<b>Geochemical Cycles</b>	Analyze the interactions between the Earth's structures, atmosphere, and geochemical cycles.
<b>Concept 2:</b>	<b>K-3</b>	<b>Objects in the Sky</b>	Identify objects in the sky.
	<b>4-8</b>	<b>Earth's Processes and Systems</b>	Understand the processes acting on the Earth and their interaction with the Earth systems.
	<b>HS</b>	<b>Energy in the Earth System (Both Internal and External)</b>	Understand the relationships between the Earth's land masses, oceans, and atmosphere.
<b>Concept 3:</b>	<b>K-4</b>	<b>Changes in the Earth and Sky</b>	Understand characteristics of weather conditions and climate.
	<b>5-8</b>	<b>Earth in the Solar System</b>	Understand the relationships of the Earth and other objects in the solar system.
	<b>HS</b>	<b>Origin and Evolution of the Earth System</b>	Analyze the factors used to explain the history and evolution of the Earth.
<b>Concept 4:</b>	<b>HS</b>	<b>Origin and Evolution of the Universe</b>	Analyze the factors used to explain the origin and evolution of the universe.

# Science Standard Articulated by Grade Level

## Coding for Articulated Standards



### Examples of Science items:

SC04-S3C1-03 (Grade 4, Strand 3, Concept 1, PO 3)  
SCHS-S2C2-01 (High School, Strand 2, Concept 2, PO 1)

**Cross-curricular references are provided in the Science Standard where appropriate. Examples of coding for other subjects are shown below:**

### Examples of Mathematics items:

M01-S1C2-02 (Grade 1, Strand 1, Concept 2, PO 2)  
MHS-S5C1-01 (High School, Strand 5, Concept 1, PO 1)

### Examples of Reading items:

R04-S3C2-02 (Grade 4, Strand 2, Concept 2, PO 2)  
R09-S1C4-01 (Grade 9, Strand 1, Concept 4, PO 1)

### Example of Health item:

1CH-F3 (Strand 1, Foundations, Concept 3)

### Example of Writing item:

W07-S3C6-01 (Grade 7, Strand 3, Concept 6, PO 1)

# Science Standard Articulated by Grade Level

## Distribution of Concepts Across Grade Levels

Strand	Concept	Concept Name	K	1	2	3	4	5	6	7	8	HS
1 Inquiry Process	1	Observations, Questions, and Hypotheses										
	2	Scientific Testing (Investigating and Modeling)										
	3	Analysis and Conclusions										
	4	Communication										
2 History and Nature of Science	1	History of Science as a Human Endeavor										
	2	Nature of Scientific Knowledge										
3 Science in Personal and Social Perspectives	1	Changes in Environment										
	2	Science and Technology in Society										
	3	Human Population Characteristics (HS)										
4 Life Science	1	Characteristics Of Organisms (K-4); Structure and Function in Living Systems (5-8); The Cell (HS)										
	2	Life Cycles (K-4); Reproduction and Heredity (5-8); Molecular Basis of Heredity (HS)										
	3	Organisms and Environments (K-4); Populations of Organisms in an Ecosystem (5-8); Interdependence of Organisms (HS)										
	4	Diversity, Adaptation, and Behavior (K-8); Biological Evolution (HS)										
	5	Matter, Energy, and Organization in Living Systems (Including Human Systems) (HS)										



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Strand	Concept	Concept Name	K	1	2	3	4	5	6	7	8	HS
5 Physical Science	1	Properties of Objects and Materials (K-4); Properties and Changes of Properties in Matter (5-8); Structure and Properties of Matter (HS)										
	2	Position and Motion of Objects (K-4); Motion and Forces (5-8) Motions and Forces (HS)										
	3	Energy and Magnetism (K-4); Transfer of Energy (5-8); Conservation of Energy and Increase in Disorder (HS)										
	4	Chemical Reactions (HS)										
	5	Interactions of Energy and Matter (HS)										
6 Earth and Space Science	1	Properties of Earth Materials (K-4); Structure of the Earth (5-8); Geochemical Cycles (HS)										
	2	Objects in the Sky (K-3); Earth's Processes and Systems (4-8); Energy in the Earth System (Internal & External) (HS)										
	3	Changes in the Earth and Sky (K-4); Earth in the Solar System (5-8); Origin and Evolution of the Earth System (HS)										
	4	Origin and Evolution of the Universe (HS)										

Shaded areas in the grid indicate concepts that have performance objectives designated for specific grade levels. Each shaded area on the grid does not necessarily represent an entire unit of classroom instruction. The number of performance objectives within a concept varies by grade level.